

Publication number : 2002-341356

Date of publication of application : 27.11.2002

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Int.Cl. G02F 1/1339

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Application number : 2001-149014

Applicant : MATSUSHITA ELECTRIC IND CO LTD

Date of filing : 18.05.2001

Inventor :

10 MINAMI SATOSHI

OGINO YUJI  
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A METHOD AND DEVICE FOR FORMING A GAP OF AN LIQUID CRYSTAL  
DISPLAY PANEL

15

[Abstract]

PROBLEM TO BE SOLVED: To provide a gap forming method and device for a liquid crystal display panel having gap accuracy of a uniform finish.

SOLUTION: A pair of glass substrates 1 opposed to each other across a panel seal 10 consisting of a UV curing resin are placed on a surface plate 2 and a chamber 8 is installed onto the glass substrates 1. An in-chamber pressurizing section 4 which is a hermetic space is formed across a chamber seal 9 within the chamber 8 and this in-chamber pressurizing section 4 is filled with high-pressure air, by which the glass substrates 1 are evenly thrust

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and the gap of the panel seal 10 is formed. The panel seal 10 is irradiated in this state with UV rays 6 from a UV lamp 5, by which the panel seal is cured and the gap of the panel seal 10 of the liquid crystal panel is uniformly finished.

**[Claim(s)]**

**[Claim 1]** A method for forming a gap of a liquid crystal display panel, which is characterized in that a pair of glass substrates face each other with a panel seal having an ultraviolet ray hardening property being sandwiched therebetween, a predetermined plate is contacted to one side of a pair of glass substrates, a predetermined gap is formed between a pair of glass substrates by pressure of air from one side, and a hardening process is performed by illuminating ultraviolet rays into a panel seal having said ultraviolet ray hardening property under the state.

**[Claim 2]** The method for forming a gap of a liquid crystal display panel as set forth in the claim 1, a buffer member is arranged between the predetermined plate and the pair of glass substrates.

**[Claim 3]** A device for forming a gap of a liquid crystal display panel, which is characterized in that it is composed of a predetermined plate for mounting a pair of glass substrates with a panel seal having an ultraviolet ray hardening property being sandwiched therebetween, a chamber having a pressure means using air and arranged on the pair of glass substrates, and an ultraviolet ray illumination means for illuminating and hardening a panel

seal having an ultraviolet ray hardening property, wherein said pressure means of the chamber applies pressure to said pair of glass substrates, thereby a predetermined gap is formed between said pair of glass substrates, and a hardening process is performed by illuminating ultraviolet rays into a  
5 panel seal having said ultraviolet ray hardening property under the state.

[Claim 4] The method for forming a gap of a liquid crystal display panel set forth in the claim 3, a buffer member is arranged between the predetermined plate and the pair of glass substrates.

**[Title of the Invention]**

**A METHOD AND DEVICE FOR FORMING A GAP OF AN LIQUID CRYSTAL  
DISPLAY PANEL**

**[Detailed Description of the Invention]**

5 **[Field of the Invention]**

The present invention is related to a method and device for forming a gap of an liquid crystal display panel, wherein a predetermined gap is formed between said pair of glass substrates, and a panel seal is hardened.

**[Description of the Prior Art]**

10 In the past, as a method for forming a gap, a gap of a seal is formed by applying an pressure corresponding to a pressure difference between a vacuum and atmosphere. Then, a pair of opposing glass substrates are put into a transparent envelope and vacuum-packed with a panel seal having an ultraviolet ray hardening property being sandwiched therebetween.

15 Below, a conventional method for forming a gap will be explained with referring to FIG. 3 and FIG. 4. As is shown in FIG. 4, a pair of glass substrates 1 faces each other with a panel seal 10 being sandwiched therebetween. As is shown in FIG. 3, they are put into an envelope 12 of a vacuum pack and the

inside is made to be vacuum state. Therefore, a seal is formed on a pair of glass substrates by applying an pressure corresponding to a pressure difference between a vacuum and atmosphere. Under the state, the gap is mounted on the predetermined plate 2, and a panel seal having said  
5 ultraviolet ray hardening property is hardened by illuminating an ultraviolet ray by UV lamp 5.

**[Problem(s) to be Solved by the Invention]**

But, according to the conventional method, when forming a gap between a pair of glass substrates 1 by a panel seal 10, since a pressure  
10 amount required for forming a gap is calculated based upon a pressure difference between a vacuum and atmosphere, there was a problem that it is difficult to control vacuum level of a vacuum pack or fine pressure change under the vacuum-pack state, and to form an uniform gap.

The object of the present invention is to provide a method and device  
15 for forming a gap of an liquid crystal display panel which can form an uniform gap.

**[Means for Solving the Problem]**

In order to accomplish above-mentioned objects, the present invention provides a method for forming a gap of an liquid crystal display

panel, which is characterized in that a pair of glass substrates face each other with a panel seal having an ultraviolet ray hardening property being sandwiched therebetween, a predetermined plate is contacted to one side of a pair of glass substrates, a predetermined gap is formed between a pair of glass substrates by pressure of the air from one side, and a hardening process is performed by illuminating an ultraviolet ray into a panel seal having said ultraviolet ray hardening property under the state.

Further, the present invention provides a device for forming a gap of an liquid crystal display panel, which is characterized in that it is composed of a predetermined plate for mounting a pair of glass substrates with a panel seal having an ultraviolet ray hardening property being sandwiched therebetween, a chamber having a pressure means using an air and arranged on the pair of glass substrates, and an ultraviolet ray illumination means for illuminating and hardening a panel seal having an ultraviolet ray hardening property, wherein said pressure means of the chamber pressures said pair of glass substrates, thereby a predetermined gap is formed between said pair of glass substrates, and a hardening process is performed by illuminating an ultraviolet ray into a panel seal having said ultraviolet ray hardening property under the state.

According to a method and device for forming a gap of an liquid crystal display panel, an uniform pressure is applied on the glass substrate by pressing an upper side of a pair of glass substrates mounted on a predetermined plate by a pressure of a pressure means using an air, and thus  
5 a predetermined gap is formed between a pair of glass substrates. Under the state, an uniform gap can be formed by illuminating a panel seal with ultraviolet rays, and hardening.

#### [Embodiment of the Invention]

Below, the embodiment of the present invention will be explained in  
10 detail with referring to the drawings.

#### (First embodiment)

FIG. 1 is a drawing of a method for forming a gap using a gap forming device of a LCD panel according to the first embodiment of the present invention. 1 is a pair of glass substrates, 2 is a predetermined plate, 3 is an  
15 UV mask, 4 is a pressure means of a chamber, 5 is an UV lamp, 6 is an ultraviolet ray, 7 is a Pyrex(a registered trademark), 8 is a chamber, 9 is a chamber seal, and 10 is a panel seal.

The operation of a gap forming device having above-mentioned structure will be explained. First of all, as is shown in FIG. 1, a pair of



opposing glass substrates 1 are mounted on the predetermined predetermined plate 2 with a panel seal 10 having an ultraviolet ray hardening property being sandwiched therebetween, and a chamber 8 is arranged on the pair of opposing glass substrates 1. A pressure means 4 which is a  
5 tightly closed space is formed with a chamber seal 9 being sandwiched in the inner side of a chamber 8. The pair of opposing glass substrates 1 is pressed uniformly by filling an air into the pressure means 4 , thereby a panel seal is formed. Then, under the state, an uniform gap of a panel seal 10 of an liquid crystal panel can be formed by illuminating ultraviolet rays with an UV lamp 5,  
10 and hardening a panel seal 10 having an ultraviolet ray hardening property.

At this time, standard brightness of the predetermined plate requires a precision corresponding to below 1/10,000mm.

(Second embodiment)

FIG. 2 is a drawing of a method for forming a gap using a gap forming  
15 device of a LCD panel according to the first embodiment of the present invention. Those parts which are denoted by same reference number of the FIG. 1 represent same parts, and ii is a buffer member.

The difference between the embodiment 1 and 2 is as follows. A buffer member 11 is arranged between a pair of opposing glass substrates 1, and

the predetermined plate 2. In this way, an uniform gap of a panel seal 10 can be formed without being affected by the intensity of standard brightness of the predetermined plate 2.

Further, in connection with the buffer member 11, a glass(the surface  
5 precision : below  $1/10,000$ mm, a thickness : 1 -1.5mm) is used as a material having a high hardness. A rubber(a thickness : 0.5-1.0mm, a Teflon(a registered trademark), and a sheet(a thickness : 0.5 -1.0mm) are enumerated as the elastic materials.

#### [Effect of the Invention]

10 As described above, according to the present invention, a pair of glass substrates is formed such that they face each other with a panel seal having an ultraviolet ray hardening property being sandwiched therebetween, a predetermined plate is contacted to one side of a pair of glass substrates, a predetermined gap is formed between a pair of glass substrates by pressure  
15 of the air from one side, and a hardening process is performed by illuminating an ultraviolet ray into a panel seal having said ultraviolet ray hardening property under the state. Therefore, an uniform gap of LCD panel can be formed.

Further, an uniform gap of LCD panel can be obtained by arranging a

**buffer member between the predetermined plate and a glass substrate, with  
eliminating the influence of a standard precision of a predetermined plate.**

**[Description of Drawings]**

**FIG. 1 is a drawing showing a structure of a gap forming device of a LCD panel according to the first embodiment of the present invention.**

**FIG. 2 is a drawing showing a structure of a gap forming device of a LCD panel according to the second embodiment of the present invention.**

**FIG. 3 is a drawing showing a structure of a gap forming device of a LCD panel according to the prior art.**

**FIG. 4 is a drawing showing a structure of a panel seal on the glass substrate.**

(19) 日本国特許庁 (J P)

(12) 公開特許公報 (A)

(11) 特許出願公開番号

特開2002-341356

(P2002-341356A)

(43) 公開日 平成14年11月27日 (2002. 11. 27)

(51) Int.Cl. <sup>7</sup>	識別記号	F I	特許庁 (参考)
G 0 2 F 1/1339	5 0 5	G 0 2 F 1/1339	5 0 5 2 H 0 8 9

審査請求 未請求 請求項の数 4 O L (全 4 頁)

(21) 出願番号 特願2001-149014(P2001-149014)

(22) 出願日 平成13年 5 月 18 日 (2001. 5. 18)

(71) 出願人 000005821

松下電器産業株式会社

大阪府門真市大字門真1006番地

(72) 発明者 南 聡

大阪府門真市大字門真1006番地 松下電器  
産業株式会社内

(72) 発明者 荻野 雄司

大阪府門真市大字門真1006番地 松下電器  
産業株式会社内

(74) 代理人 100112128

弁理士 村山 光威

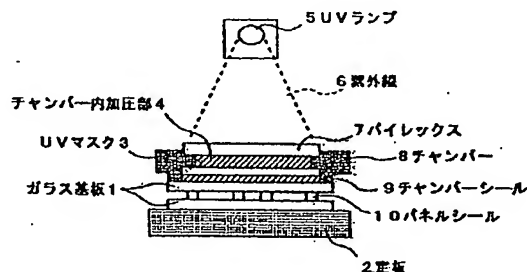
Fターム (参考) 2H089 NA39 NA44 NA56 NA60 QA14

(54) 【発明の名称】 液晶表示パネルのギャップ形成方法及びその装置

(57) 【要約】

【課題】 均一な仕上がりのギャップ精度を持つ液晶表示パネルのギャップ形成方法及び装置を提供する。

【解決手段】 定板2の上に、紫外線硬化樹脂からなるパネルシール10を挟んで対向させた一対のガラス基板1を載置し、そのガラス基板1上に、チャンバー8を設置する。チャンバー8の内部には、チャンバーシール9を介して密閉空間であるチャンバー内加圧部4が形成されており、このチャンバー内加圧部4に高圧エアを満たすことによりガラス基板1を均等に押圧してパネルシール10のギャップが形成される。そして、その状態のまま、UVランプ5より紫外線6を照射することで、パネルシール10の硬化を行い、液晶パネルのパネルシール10のギャップが均一に仕上げられる。



【特許請求の範囲】

【請求項1】 紫外線硬化性のパネルシールを挟んで一対のガラス基板を対向させ、前記一対のガラス基板の一方の面に定板を当てるとともに、他方の面からエアによって圧力をかけて前記一対のガラス基板間に所定のギャップを形成し、その状態において前記紫外線硬化性のパネルシールに紫外線を照射して硬化させることを特徴とする液晶表示パネルのギャップ形成方法。

【請求項2】 定板と一対のガラス基板との間に緩衝材を設けたことを特徴とする請求項1記載の液晶表示パネルのギャップ形成方法。

【請求項3】 紫外線硬化性のパネルシールを挟んで対向させた一対のガラス基板を載置する定板と、載置された一対のガラス基板上に設置されエアによる加圧手段を有するチャンバーと、前記紫外線硬化性のパネルシールに紫外線を照射して硬化させる紫外線照射手段とを備え、前記チャンバーの加圧手段により前記一対のガラス基板を加圧して前記一対のガラス基板間に所定のギャップを形成し、その状態において前記紫外線照射手段により前記紫外線硬化性のパネルシールに紫外線を照射して硬化させることを特徴とする液晶表示パネルのギャップ形成装置。

【請求項4】 定板とガラス基板との間に緩衝材を設けたことを特徴とする請求項3記載の液晶表示パネルのギャップ形成装置。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】 本発明は、液晶パネルにおける一対のガラス基板間に所定のギャップを形成してパネルシールを硬化させる液晶表示パネルのギャップ形成方法及びその装置に関する。

【0002】

【従来の技術】 従来、この種のギャップ形成方法としては、紫外線硬化性のパネルシールを挟んで対向させた一対のガラス基板を透明な袋に入れて真空パックすることにより大気圧と真空との圧力差で加圧してシールのギャップを形成し、その状態のまま紫外線を当ててパネルシールの硬化を行っていた。

【0003】 以下に従来のギャップ形成方法について、図3、図4を用いて説明する。図4で示したように、一対のガラス基板1はパネルシール10を挟んで対向させ、図3のように、真空パックの袋12の中に入れて内部を真空状態にする。そこで、一対のガラス基板は、大気圧と真空との圧力差によって加圧され、シールのギャップを形成する。その状態のまま、定板2上に載置し、UVランプ5により紫外線6を照射することで紫外線硬化樹脂からなるパネルシール10を硬化させる。

【0004】

【発明が解決しようとする課題】 しかしながら、上記の

従来の方法では、パネルシール10による一対のガラス基板1間のギャップを形成する際に、真空と大気圧の圧力差によってギャップ形成に必要な加圧量を得るようにしているため、真空パックの状態では微妙に圧力が変動したり、真空パックの真空度の調整が難しく、均一なギャップの形成が難しいという問題があった。

【0005】 本発明は、上記従来の問題点を解決し、均一なギャップの形成ができる液晶表示パネルのギャップ形成方法及びその装置を提供することを目的とする。

【0006】

【課題を解決するための手段】 上記の目的を達成するために、本発明の液晶表示パネルのギャップ形成方法は、紫外線硬化性のパネルシールを挟んで一対のガラス基板を対向させ、前記一対のガラス基板の一方の面に定板を当てるとともに、他方の面からエアによって圧力をかけて前記一対のガラス基板間に所定のギャップを形成し、その状態において前記紫外線硬化性のパネルシールに紫外線を照射して硬化させることを特徴とするものである。

【0007】 また、本発明の液晶表示パネルのギャップ形成装置は、紫外線硬化性のパネルシールを挟んで対向させた一対のガラス基板を載置する定板と、載置された一対のガラス基板上に設置されエアによる加圧手段を有するチャンバーと、前記紫外線硬化性のパネルシールに紫外線を照射して硬化させる紫外線照射手段とを備え、前記チャンバーの加圧手段により前記一対のガラス基板を加圧して前記一対のガラス基板間に所定のギャップを形成し、その状態において前記紫外線照射手段により前記紫外線硬化性のパネルシールに紫外線を照射して硬化させることを特徴とするものである。

【0008】 上記本発明の液晶表示パネルのギャップ形成方法及び装置によれば、定板に載置された一対のガラス基板の上からエアによる加圧手段を用いて加圧するので、ガラス基板には均一な圧力がかかり、したがって、一対の基板間に所定のギャップが形成される。そして、その状態でパネルシールに紫外線を照射して硬化させるので、ギャップを均一に上げることができる。

【0009】

【発明の実施の形態】 以下、本発明の実施の形態について、図面を参照して詳細に説明する。

【0010】 (実施の形態1) 図1は、本発明の実施の形態1における液晶表示パネルのギャップ形成装置を用いたギャップ形成方法を示したもので、1は一対のガラス基板、2は定板、3はUV(紫外線)マスク、4はチャンバー内加圧部、5はUV(紫外線)ランプ、6は紫外線、7はバイレックス(登録商標)、8はチャンバー、9はチャンバーシール、10はパネルシールである。

【0011】 以上のように構成されギャップ形成装置について、以下その動作を説明する。まず、定板2の上



!(4) 002-341356 (P2002-01656

【図3】

